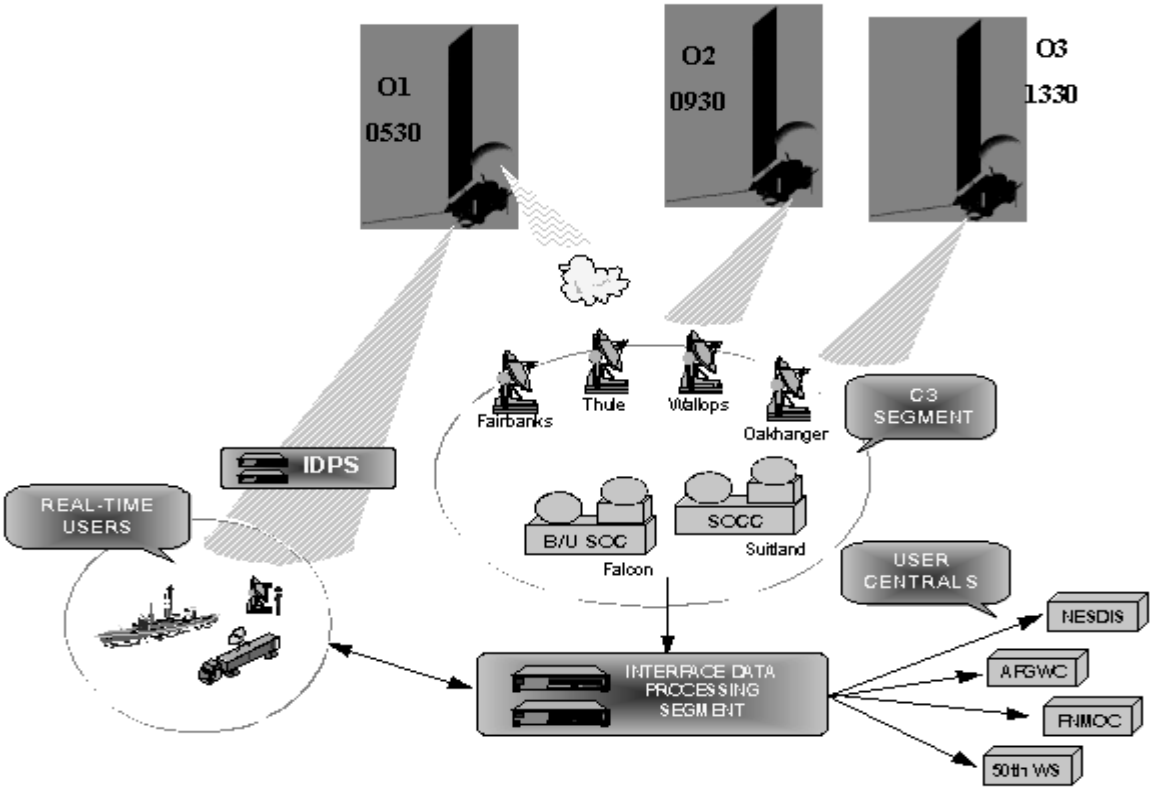
NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM (NPOESS)



Air Force ACAT ID Program		**Prime Contractor**
Total Number of Systems:	5 satellites	TBD
Total Program Cost (TY$):	$4.9B	
Average Unit Cost (TY$):	$985M	
MS II/III:	2QFY02	
First Launch:	2008	

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The National Polar-Orbiting Operational Environmental Satellite System (NPOESS) is a tri-agency program jointly administered by DoD, the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA). The program is managed by the NPOESS Executive Committee through an Integrated Program Office (IPO), and is being acquired under U.S. Air Force acquisition authority. NPOESS will provide a national remote sensing capability to acquire and disseminate global and regional environmental data for a period of at least ten years after achieving initial operational capability.

For military users, NPOESS will provide an enduring capability to receive and disseminate global and regional meteorological, environmental, and associated data at varying update rates depending on the military needs. These data shall include, but are not limited to, cloud imagery, atmospheric

temperature and moisture, and solar-geophysical data to support worldwide military operations. NPOESS will provide the warfighter with the ***information superiority*** needed to execute the operational concepts of ***dominant maneuver***. NPOESS also supports ***precision engagement***, enhancing our forces' ability to plan and execute air, land, and sea operations throughout a large spectrum of challenging environmental conditions.

NPOESS contains the following segments:

- The Space segment, comprised of satellite platforms containing sensors and communications devices, will collect, store, and downlink data to the command, control, and communications C^3 segment and users on the ground. The satellites are commanded to selectively download all data to ground stations as well as provide continuous downlink of data for receipt by DoD field units deployed worldwide.

- The Launch Support segment comprises launch facilities and support equipment. NPOESS is expected to operate in a sun-synchronous, near-polar orbit at approximately 833 km in altitude.

- The C^3 segment includes all functions required for day-to-day state-of-health monitoring of all operating spacecraft and supports the delivery of data to designated primary terminals known as Centrals.

- The Interface Data Processor segment is comprised of data processing functions for two subcomponents, the Centrals and the Field Terminals. Stored data will be delivered to the Centrals' Interface Data Processor component via the C^3 segment. In addition, the spacecraft will provide real-time data directly to military field terminal components and surface receivers operated by worldwide weather services and other agencies. This real-time data will be available to receivers within direct site of the NPOESS satellite while it is overhead.

BACKGROUND INFORMATION

The U.S. government currently operates and maintains two polar-orbiting meteorological satellite systems. The U.S. Air Force operates the military's Defense Meteorological Satellite Program system, while NOAA operates the Polar-Orbiting Operational Environmental Satellite (POES) system. To reduce the costs of acquiring and operating polar-orbiting satellites, a White House decision to integrate the two weather satellite programs into a single system was announced May 1994. This decision, as part of a National Performance Review recommendation, was expected to save the U.S. government up to an estimated $300 million in the FY96-FY99 period, with additional savings expected after FY99.

NPOESS Milestone I occurred in FY97. The Program Definition/Risk Reduction phase was structured around multiple contracts for individual sensor and algorithm development, to be followed by multiple pre-Total System Performance Responsibility (TSPR) contracts. Multiple sensor contracts were awarded for each higher risk sensor and/or suite of sensors. A single contractor for each payload is being selected after each sensor/suite Preliminary Design Review and Call for Improvement. The pre-TSPR contract awards were to occur in FY99, and selection of the final TSPR contractor was to occur shortly after Milestone II in FY00. However, the pre-TSPR awards and other program events were delayed and modified due to budget reductions.

As part of FY99 budget reductions, the Program Office delayed and modified the acquisition baseline. The revised baseline delays delivery of the first satellite by one year to July 2008. Along with this delay, the pre-TSPR contract was delayed from FY99 to FY01, and the Milestone II/III and EMD award dates were delayed from FY00 to FY02. The pre-TSPR phase of the program was also modified, with two new Program Definition and Risk Reduction contracts to be awarded in 1QFY00, to address data processing risks and bring the program to a System Functional Review level of development prior to the pre-TSPR contract award. In addition, changes in the risk reduction activities included elimination of some risk reduction sensors on the last POES satellite (satellite N'), delays in the development of several sensors, and a reduction in some test bed funding.

In place of the satellite N' risk reduction sensors, the IPO is investigating alternative risk reduction efforts under the NPOESS Preparatory Project (NPP). The NPP is a joint IPO/NASA space flight of selected critical imager and sounding systems. This flight will provide NPOESS with a risk reduction demonstration and provide NASA with selected sensor data to provide continuity with the current environmental and weather satellites.

In addition to FY99 budget reductions, planned European participation in NPOESS has also been reduced. NPOESS planned to fly a subset of its sensor packages on the European Meteorological Satellite Organization Meteorological Operational Program-3 (METOP-3) satellite, which would have increased NPOESS coverage and data refresh rate at relatively low cost. Without METOP-3 satellite support, the first two NPOESS satellites would be unable to meet DoD imagery refresh rate requirements. The Program Office is investigating options to mitigate the impact of a loss of the METOP-3 orbit.

TEST & EVALUATION AND RISK REDUCTION ACTIVITY

The initial TEMP was approved in March 1997. Consistent with the program's early stage of development, and to be responsive to modifications in the risk reduction efforts, a working copy of the TEMP is maintained by the System Program Office, and changes impacting the military portions of the program are monitored by DOT&E to ensure consistency and adequacy. As the program gets closer to Milestone II/III, a formal update will be required. A tri-Agency operational test group will conduct NPOESS OT&E, with AFOTEC acting as the lead test agency. The OT program will consist of operational assessments, combined DT/OT, and end-to-end IOT&E of the military portions of the NPOESS system. To support early assessments and combined DT/OT, operational testing will augment field data with results from validated models, simulations, and Hardware-in-the-Loop testbeds.

During the Program Definition/Risk Reduction phase, DT&E consists of sensor design and algorithm testing using a government-developed and operated Integrated Weather Product Test Bed (IWPTB) to ensure that each selected sensor contractor has provided a design/algorithm combination that meets NPOESS technical requirements. IWPTB is being used to develop and validate government-certified simulated scenes, which will be used to compare sensor design and algorithm performance, and aid sensor design by the contractors. This IWPTB will provide a legacy capability to the final TSPR contractor and to operational testers for design-specific Hardware-in-the-Loop testbeds to be developed during the EMD phase.

During FY99, as part of risk reduction, preliminary design reviews were held on three NPOESS sensor suites: the Global Positioning System Occultation Sensor (GPSOS) in November 1998, the Ozone/Mapper Profiler Suite (OMPS) in January 1999, and the Cross-Track Infrared Sounder (CrIS) in April 1999. Sensor comparisons were conducted on the CrIS and OMPS as part of the IWPTB activities,

and supported down-select to a single contractor for each of these sensor suites. As part of the program restructure, more cost-effective acquisition strategies for the GPSOS are being pursued. Preliminary design reviews on two others, the Visible/Infrared Radiometer Suite (VIIRS) and the Conical Microwave Imaging Suite will be held in FY00. Furthermore, three critical imaging and sounding systems, the VIIRS, the CrIS, and NASA's Advanced Technology Microwave Sounder, are being considered as part of the restructured NPP risk reduction demonstration flight scheduled for FY05, to replace planned flights on the POES N' satellite.

AFOTEC will perform a DOT&E-directed OA on the military portions of NPOESS in FY01 to support the Milestone II/III decision in 2QFY02. During 1999, AFOTEC continued developing the structure for this OA, which will tentatively include four areas: programmatic voids; program documentation and testability; ability of the program to support OT&E; and assessment of special field activities. Data for this OA will potentially come from program documentation, validated modeling and simulation, and IWPTB results.

Throughout the program, combined DT/OT will be used, when appropriate, to minimize the time required for dedicated IOT&E and to reduce design risk by providing an operational perspective as early as possible in the acquisition process. During dedicated IOT&E, the operational testers will conduct testing on production-representative hardware and software, supplemented as required with data from validated and accredited modeling & simulation. Such testing will use typical users trained and certified in NPOESS operations and maintenance. Personnel will operate the system with a combination of scenarios, exercises, and real-world events in an operational environment.

TEST & EVALUATION ASSESSMENT

NPOESS is still in the Program Definition/Risk Reduction phase. Only limited DT, and no dedicated OT&E, has been conducted on the program. DOT&E's current activities are concentrated on reviewing risk reduction activities, development of operational assessment plans and the TEMP, and ensuring that the program continues to evolve towards an operationally effective and suitable system.

Until the METOP-3 orbit or its equivalent is recovered, threshold user requirements for imagery refresh rates will not be met, and the NPOESS architecture will not support an operationally effective system. Furthermore, major challenges remain in structuring changes to risk reduction activities caused by funding reductions and in identifying the T&E resources required to support an adequate test program. Removal of the risk reduction sensor suites to be flown on POES N' makes the NPP mission, or a suitable alternative, critical to fielding an operationally effective system. Furthermore, it is essential that adequate ground-based Hardware-in-the-Loop testbeds be available to test the NPOESS ground segment prior to the first satellite launch.

LESSONS LEARNED

The tri-Agency nature of NPOESS, in combination with DoD's acquisition reform initiative, required innovative methods to develop the NPOESS TEMP and other required program documentation. The Integrated Process Team approach serves the program well, allowing for substantive discussions and rework at the informal level before these products are formally developed and submitted. Nonetheless, the Total System Performance Responsibility aspect of acquisition reform will require close monitoring to ensure continued compliance with regulatory and statutory requirements involving OT&E.